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HAEMATOZOA OF ITALIAN BIRDS. II: FIRST EUROPEAN RECORD OF *HAEMOPROTEUS GALLINULAE* DE MELLO, 1935 FROM *GALLINULA CHLOROPUS* AND REDESCRIPTION

(*Apieomplexa Haemosporina*)

Abstract. — We redescribe *Haemoprotcus gallinulae* De Mello, 1935 from a Moorhen (*Gallinula ehloropus*) collected in Northern Italy. This parasite had never been recorded so far in Europe and the original description, based on a single specimen obtained from one Moorhen shot in Goa, India, is incomplete and lacks biometric measurements of the gametocytes. Recently a redescription of *H. gallinulae* was made by Bennett (1980) from *Rallina eurizonoides* and from *Fuliea amerieana.*

Riassunto. — Haematozoa *degli uecelli italiani, II: prima segnalazione europea di* Haemoproteus gallinulae *De Mello, 1935 in* Gallinula chloropus *e sua rideserizione* (Apicomplexa Haemosporina).

Viene ridescritto *Haemoproteus gallinulae* trovato in un Gallinella d'acqua catturata in provincia di Pavia. Questo parassita non è mai stato segnalato in precedenza in Europa e la descrizione originale è stata fatta da De Mello su di un esemplare di *Gallinula chloropus* catturato a Goa (India). Recentemente Bennett (1980) ha ridescritto *H. gallinulae* in *Rallina eurizonoides* e in *Fuliea americana.*

Introduction.

De Mello (1935) described *Haemoproteus gallinulae* from a Moorhen (*Gallinula chloropus*) shot at the lake Carambolin (Goa, India), but gave neither photomicrographs nor measurements of the gametocytes.

In a list of the presumably valid species of the genus *Haemoproteus* (Levine & Campbell, 1971), *H. gallinulae* De Mello, 1935 was included, but no additional records for this parasite were given. Recently Bennett

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(1980) redescribed *Haemoproteus gallinulae* from *Rallina eurizonoides* collected in the Philippine Islands and from *Fulica americana* collected in Canada. In Western Europe, only one Moorhen infected by *Leucocytozoon sp.* (COLES, 1914), was sampled during the period 1890-1978 (PEIRCE, 1981). In Italy FRANCHINI (1924) described an haemoproteid (*Halteridium danilewskii*) from *Rallus aquaticus*.

Blood smears obtained from a Moorhen in Northern Italy showed a haemoproteid identified as *H. gallinulae*, and from this material a redescription of the parasite is given, as follows.

Materials and methods.

During the years 1983-1984, 111 moorhens were collected in the province of Pavia (Northern Italy). Thin smears obtained from peripheral blood were air-dried, fixed with methanol 100% and stained with Giemsa's method. Only one bird, collected on 24 IX/83, was infected. Observations and photographs were made using a Zeiss photomicroscope at 100x with a planapochromat objective and an Optivar setting of 1.25. Measurements of gametocytes were made drawing the cells on the Visopan Reichert microscope.

Results.

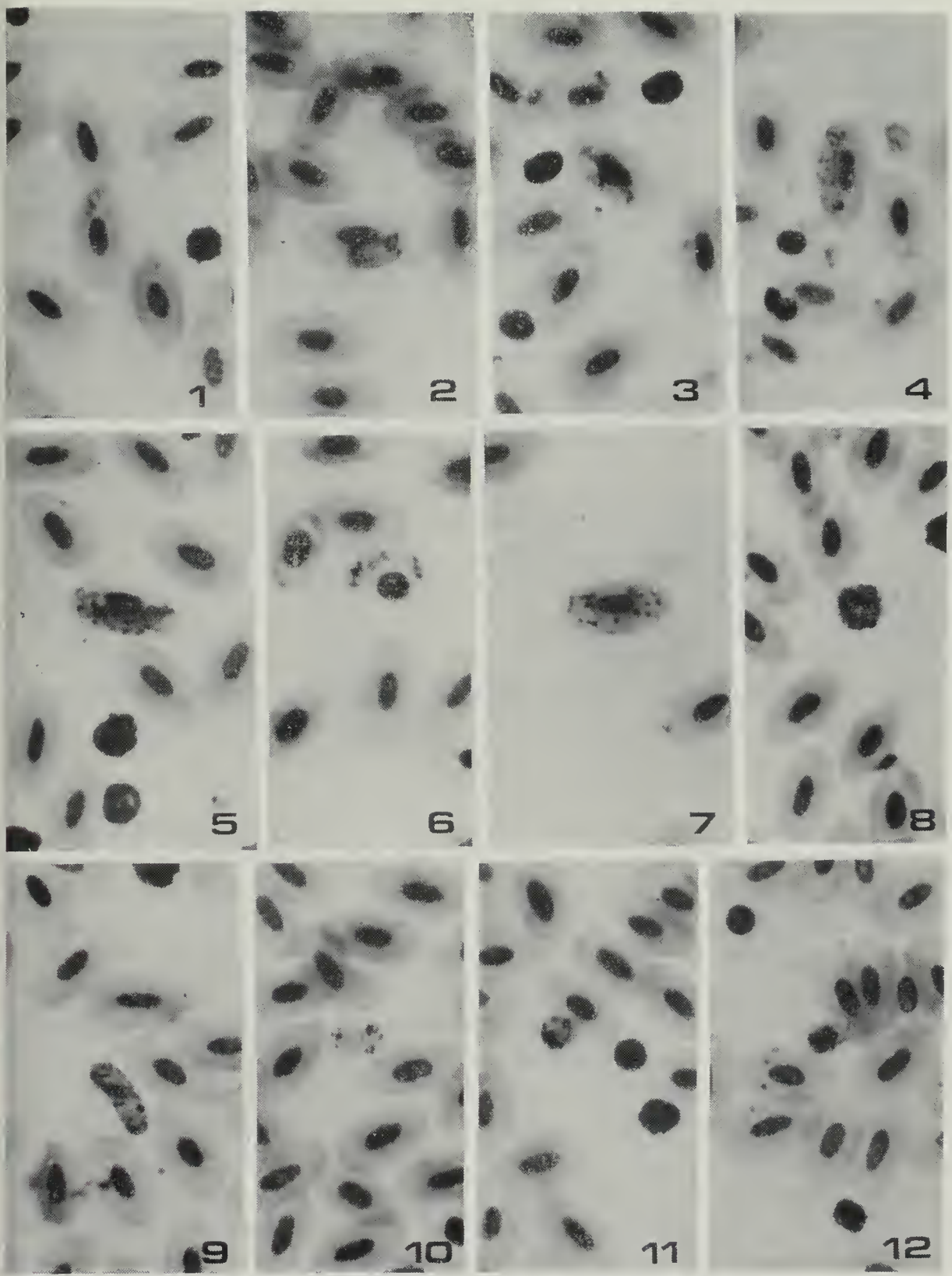
The level of parasitemia in the Moorhen was very low ($< 0{,}1\%$) with a preponderance of macrogametocytes (sex ratio $\varphi : \delta = 2:1$).

Redescription of *Haemoproteus gallinulae* De Mello, 1935.

Young trophozoites and *immature gametocytes* take up respectively a polar and lateral position within the erythrocytes (Fig. 1 and 2). Double infections are rare (Fig. 3).

Macrogametocytes: oval or sausage-shaped with round extremities when immature (Fig. 4); curve around the host cell nucleus occupies at least three-quarters of the erythrocyte's cytoplasm when mature (Fig. 5). At this stage the red cell shows a lateral displacement of the host cell nucleus. The vacuolated cytoplasm of the parasite stains deep blue with Giemsa, and brownish-black pigment granules of different size are randomly distributed. The number of pigment granules ranges from 18 to 36 (mean 24.59). Parasite nucleus in pink or reddish, large, median and oval shaped.

Microgametocytes: oval, take up a latero-polar position when immature (Fig. 6); they occupy about two-thirds of the erythrocyte's cytoplasm when mature (Fig. 7). Host cell shows a laterally displaced nucleus.



Figs. 1-12. — *Haemoproteus gallinulae* from *Gallinula chloropus*. 1. Young trophozoites; 2. Immature gametocyte; 3. Double infection; 4. Young macrogametocyte; 5. Macrogametocyte; 6. Young microgametocyte; 7. Microgametocyte; 8-9. Extracellular macrogametocytes; 10.-11. Extracellular microgametocytes; 12. Exflagellation.

The cytoplasm of the parasite is pale blue with dark-brown pigment granules of different size grouped at the poles. The number of pigment granules ranges from 17 to 26 (mean 21.18).

The parasite nucleus is median and irregularly shaped with pale pink-staining dense strand of chromatin.

When the parasite is fully mature a complete lysis of the host's cell is possible, and round, bean shaped (Fig. 8, 9), or irregular (e.g. with one pointed end) free macrogametocytes were observed in the plasma. Oval and round microgametocytes too (Fig. 10, 11) were found as free forms in the plasma.

These extracellular forms may likely be early stages of the microgamete formation (Fig. 12).

Measurements of normal and infected erythrocytes are summarized in Table I.

Parasite: *Haemoproteus gallinulae* De Mello, 1935

Host: *Gallinula chloropus* (L.)

Vector: Unknown

Distribution: India and Italy

Material: Deposited in Dipartimento di Biologia Animale, University of Pavia, Italy (in the Authors' collection).

Comments.

In the description of *H. gallinulae* De Mello, 1935 no designation of type material was made and the location of the original blood smears by De Mello is unknown.

Although the Moorhen is considered a monotypic species in Eurasia (Cramp & Simmons, 1979), we prefer not to designate as neotype the blood smear on which the present redescription is based. As a matter of fact our record has been obtained from a geographic area very far away from where De Mello (1935) collected his material.

De Mello's original description, although provided with rather sketchy illustrations and lacking measurements of gametocytes, is quite specific and morphological features either of young or of mature gametocytes correspond to our descriptions. The original illustrations also show clumping of pigment at the poles in the microgametocyte, and a scattered distribution in the macrogametocyte, but the number of these pigment granules is not given. De Mello observed and depicted macrogametocytes, oval or irregular, free in the plasma which correspond to the forms observed in our material. Instead, the extracellular forms of microgame-

TABLE I. — Morphometric parameters of *H. gallinulae*. Means expressed in μ and Standard Deviations (in parentheses) of 10 gametocytes and 10 normal erythrocytes.

	Erythrocyte			Erythrocyte nucleus			Parasite			No pigment granules
	Length	Width	Area	Length	Width	Area	Length	Width	Area	
Parasitized:										
Macrogametocytes	14.4 (0.7)	6.7 (0.7)	72.3 (8.7)	5.1 (0.5)	2.3 (0.3)	8.4 (1.6)	13.4 (1.2)	4.1 (0.9)	46.7 (8.6)	24.6 (3.7)
Microgametocytes	14.4 (1.0)	6.6 (0.8)	68.7 (5.2)	5.0 (0.4)	2.3 (0.4)	8.3 (1.0)	14.0 (0.9)	4.9 (0.8)	52.3 (5.6)	21.2 (3.0)
Non-parasitized	13.0 (1.0)	6.8 (0.2)	63.9 (5.7)	5.2 (0.4)	2.2 (0.2)	8.6 (1.5)				

tocytes observed by us were not reported in De Mello's original description. The occurrence of haemoproteids in the Moorhen appears to be rare: as a matter of fact *H. gallinulae* redescribed here represents probably the only record from Europe.

In a recent paper by BENNETT (1980) *Haemoproteus fulicae* da Fonseca, 1938, is considered to be a synonym of *H. gallinulae* De Mello, 1935, and the redescription of *H. gallinulae* was made on the basis of haemoproteids found in *Railina eurizonoides* and in *Fulica americana*. The shapes and sizes of micro- and macrogametocytes described by Bennett are different from our data, and the description of extracellular forms was not given. Probably this is due to different morphology and structure of erythrocytes found in separate host genera. The highly pleiomorphic feature of *H. gallinulae* and its occurrence in hosts belonging to different genera of the family Rallidae are questionable, for lack of data of experimental infections.

Moreover, *Haemoproteus* is usually considered a highly specific parasite (BAKER, 1966 and 1968) and in a recent check-list of the genus *Haemoproteus*, LEVINE & CAMPBELL (1971) write that it is «...dangerous to attempt to synonymize species without cross-transmission studies. We are therefore going on the general principle that the species of *Haemoproteus* in different host genera are different, even the future research may prove this wrong ».

REFERENCES

BAKER J. R., 1966 - *Haemoproteus palumbis sp. nov.* (Sporozoa, Haemosporina) of the English wood-pigeon *Columba p. palumbus* - *J. Protozol.*, 13, pp. 515-519.

BAKER J. R., 1968 - The host restriction of *Haemoproteus columbae* - *J. Protozool.*, 15, pp. 334-335.

BENNETT G. F., 1980 -Avian Haemoproteidae. 14. The haemoproteids of the avian family Rallidae - *Can. J. Zool.*, 58, pp. 321-325.

COLES A. C., 1914 - Blood parasites found in mammals, birds and fishes in England - *Parasitology*, 7, pp. 17-61.

CRAMP S. & SIMMONS K. E. L. (eds.), 1980 - The Birds of the Western Palearctic. Vol. II. Hawks to Bustards - *Oxford University Press*, London.

DE MELLO F., 1935 - New haemoproteids in some Indian birds - *Proc. Ind. Acad. Sci.*, 2, pp. 460-475.

FRANCHINI G., 1924 - Observations sur les haematozoaires des oiseaux d'Italie (2° note) - *Ann. Inst. Pasteur Paris*, 38, pp. 470-515.

LEVINE N. D. & CAMPBELL G. R., 1971 - A Check-list of the species of the genus *Haemoproteus* (Apicomplexa, Plasmodidae) - *J. Protozool.*, 18, pp. 475-484.

PEIRCE M. A., 1981 - Distribution and host parasite check-list of the haematozoa of birds in Western Europe - *Journal natural History*, 15, pp. 419-458.